REMARKS

Claims 1 - 28 are pending in the application. Claims 1 - 28 stand rejected by the Examiner under 35 U.S.C § 102(b). Reconsideration of the application is respectfully requested. With this Office Action Response, Applicant is submitting an IDS and supplementing the drawings with support for the drawings as requested by the Examiner.

Independent Claims 6 and 16 have been amended for antecedent basis. No new matter has been added.

REJECTION UNDER 35 U.S.C. § 102(b)

Claims 1-28 stand rejected under 35 U.S.C. § 102(b) as being anticipated by *Chambers* in US 4,992,993.

With regard to Claim 1: *Chambers* discloses a method of determining a time value, called a travel time differential, from the velocity difference between two water velocity models by multiplying the water depth difference between two positions by the difference of the inverse between the velocities of the two models. The travel time differential between the two models is applied to the arrival times of the seismic events associated with the bottom and sub-bottom layers (Column 3, lines 9-12, Column 7, lines 41-440) or alternatively the time difference applied to the wavefield travel time of the second model (Column 3, lines16-21, Column 7, lines 49-52).

As regards Claim 1 of the present application, Applicant discloses the limitation of applying the determined time correction to seismic data before normal moveout. In order for a claimed invention to be unpatentable under 35 USC § 102 over a prior art reference, the prior art reference must show each and every limitation of the claimed invention arranged as in the claim. The application of the determined time correction prior to normal moveout (NMO) limitation in Claim 1 is clearly lacking in the prior art of *Chambers*. Accordingly, applicant respectfully submits that claim 1 and claims 2 – 5 that depend upon Claim 1 are patentable under 35 USC § 102.

Furthermore, none of the prior art of record teaches or suggests the determining an observed velocity, and using the observed velocity for determining a time correction as disclosed and claimed in our application, and then applying the time correction to seismic data before normal moveout. In order to sustain an obviousness rejection under 35 USC § 103, two requirements must be met. First, the prior art of record must disclose all the limitations of the claimed invention. Additionally, there must be a suggestion in the prior art of record to combine the limitations as in the claimed invention. The suggestion to combine these limitations is clearly lacking in the prior art of the present case. Accordingly, applicant respectfully submits that Claim 1 is patentable under 35 U.S.C. § 103 over *Chambers*. Further, applicant respectfully submits that Claim 1 and the claims that depend on Claim 1 are patentable under 35 U.S.C. § 103.

As regards Claim 6 we disagree with the Examiner's contention that an <u>offset correction delta T</u> may determined using the RMS or stacking velocity $X^2 - T^2$ analysis disclosed in *Chambers* or any other prior art $X^2 - T^2$ analysis of which we are aware. As defined in The Encyclopedic Dictionary of Geophysics by Sheriff, page 336, (1991), the well known $X^2 - T^2$ analysis disclosed in Chambers is:

a method of determining stacking velocity V_s and the depth of a reflector Z from the arrival time versus offset relationship:

$$V_s^2 t^2 = 4z^2 + x^2$$

The square of the source-to-geophone distance or offset (x^2) is plotted against the square of the reflection time (t^2); the slope gives the inverse of the velocity squared and the depth can be obtained from the intercept. Applies only to a

constant velocity medium. Because of the variation of velocity with depth,

$(x^2 - t^2)$ curves are not perfectly straight lines. For horizontal velocity layering

and horizontal reflectors, the stacking velocity V_S is given by the slope at the

origin.

We respectfully point out that the $X^2 - T^2$ equation in Figure 3 of the *Chambers*

disclosure is not used to directly determine a delta T or time differential to apply to the

data, much less an offset correction delta T. Instead, the velocities determined with this

analysis for a particular model are combined with a velocity analysis from another model

in the equation in column 4, line 38 to determine a time differential to apply to the

seismic data (the arrival times or the second model). The time differential is not an offset

correction delta T; it is a single value time differential to apply to the seismic data

irrespective of offset.

As explained in *Chambers* [the method will]:

"calculate first and second hyperbolic moveout functions for the first and

second models in terms of the offset distance between the source and

receiver points. The time difference between the first and second

hyperbolic moveout functions is measured and applied to the wavefield

travel time of the second model to create a replacement time that is

applied to the arrival times of the seismic events." [column 3, lines 14-21]

In other words, while the hyperbolic moveout functions are determined using the

offset distance, the measured time difference <u>between</u> the hyperbolic moveout functions

does not depend on, nor is a correction for, offset distance.

Chambers discloses a method of determining velocities for water layer models and therefrom determining and applying a time differential for seismic records. Chambers uses stacking velocity differences among the water layer models to determine these time differentials, which we contend are inherently single valued static (not dynamic) times for application to seismic data. We respectfully point out that *Chambers* does not disclose determining a water velocity <u>dynamic</u> correction, which may be offset and/or angle dependent, as disclosed in our application (for example, paragraphs 22 through 33 and the figures referenced therein).

In order for a claimed invention to be unpatentable under 35 USC § 102 over a prior art reference, the prior art reference must show each and every limitation of the claimed invention arranged as in the claim. The 'water velocity dynamic correction' limitation is clearly lacking in the prior art of *Chambers*. Accordingly, applicant respectfully submits that claim 6 and claims 7 – 15 that depend upon claim 6 are patentable under 35 USC § 102.

Likewise, independent claim 16 also contains the 'water velocity dynamic correction' limitation which is not in the *Chambers* prior art. Accordingly, applicant respectfully submits that claim 16 and the claims that depend upon claim 16 are all patentable under 35 USC § 102.

Furthermore, none of the prior art of record teaches or suggests the 'water velocity dynamic correction' as disclosed and claimed in our application to seismic data. In order to sustain an obviousness rejection under 35 USC § 103 the prior art of record must disclose all the limitations of the claimed invention and there must be a suggestion in the prior art of record to combine the limitations as in the claimed invention. The suggestion to combine these limitations is clearly lacking in the prior art of the present case. Accordingly, applicant respectfully submits that Claim 6 and Claim 16, are patentable under 35 U.S.C. § 103 over *Chambers*. Further, applicant respectfully submits that Claim 6 and Claim 16 as well their respective dependent claims are patentable under 35 U.S.C. § 103.

As regards claim 24, we note that Claim 24 contains the limitation of an 'angle dependent time correction.' We respectfully point out that there is no angle dependence in the equations or methods used in Chambers. In fact, neither the word 'angle,' nor any combinations of words that mean 'angle,' appears in *Chambers*. All measurements to be found in *Chambers* do not vary with a change in angle. While there are changes in angles that are inherent in the travel paths of the seismic energy as distance changes with offset, the hyperbolic moveout functions completely account for this change of angle with offset, and the time differential calculations are independent of both angle and offset. Unlike the method of *Chambers*, the present invention discloses and claims an angle dependent time correction limitation.

The 'angle dependent time correction' limitation is clearly lacking in the prior art

of *Chambers*. Accordingly, applicant respectfully submits that claim 24 and claims 25 –

28 that depend upon claim 24 are patentable under 35 USC § 102. Furthermore, none of

the prior art of record teaches or suggests the 'angle dependent time correction' as

disclosed and claimed in our application to seismic data. In order to sustain an

obviousness rejection under 35 USC § 103, the prior art of record must disclose all the

limitations of the claimed invention and there must be a suggestion in the prior art of

record to combine the limitations as in the claimed invention. The suggestion to combine

these limitations is clearly lacking in the prior art of the present case. Accordingly,

applicant respectfully submits that Claim 24 is patentable under 35 U.S.C. § 103 over

Chambers. Further, applicant respectfully submits that Claim 24 as well the respective

dependent claims of claim 24 are patentable under 35 U.S.C. § 103.

In summary, the method of the present invention contains elements that are not

disclosed in *Chambers*, or the prior art. The prior art does not disclose applying the time

corrections determined according the method of the present invention to seismic data

prior to normal moveout; the prior art does not disclose water velocity dynamic

corrections; nor does the prior art disclose angle dependent time corrections as

determined according to our specification, figures and claims.

Each limitation of the all the independent and dependent claims are adequately

supported by the specifications and are therefore patentable for the reasons stated above.

For all of the above reasons, Applicant submits that the application is patentable over the

prior art of record and respectfully requests that the claims of the application be allowed.

594-25572US   19

No new material has been added by this office action response. Consideration of the application, as amended, is respectfully requested. No fee is believed to be due for these amendments. The Commissioner is hereby authorized to charge any fee due for these amendments to **Deposit Account No. 50-1720 (594-25572)**.

Respectfully submitted,

Date: June 5, 2003

Kaushik P. Sriram,
Reg. No. 43,150
2603 Augusta, Suite 700
Houston, Texas 77057-5638
Tel: (713) 266-1130
Fax: (713) 266-8510
Attorney For Applicants